



Smart Licensing

This chapter describes the smart licensing configuration on Cisco NCS 1004.

- [Understanding Smart Licensing, on page 1](#)
- [Generic Smart Licensing, on page 5](#)
- [Creating a Token, on page 8](#)
- [Configure Smart Licensing, on page 8](#)
- [Smart Licensing Transport Modes, on page 17](#)
- [Smart Licensing for OTN-XP Line Card, on page 21](#)
- [Smart Licensing for QXP Line Card, on page 23](#)

Understanding Smart Licensing

Smart Licensing is a cloud-based approach to licensing. Smart Licensing simplifies the licensing experience across the enterprise making it easier to purchase, deploy, track, and renew Cisco Software. It provides visibility into license ownership and consumption through a single, simple user interface. The solution allows you to easily track the status of your license and software usage trends.

Smart Licensing helps you simplify three core functions:

- **Purchasing:** The software that you have installed in your network can be registered, without Product Activation Keys (PAKs).
- **Management:** You can automatically track activations against your license entitlements. Also, there is no need to install the license file on every node. You can create license pools (logical grouping of licenses) to reflect your organization structure. Smart Licensing offers you Cisco Smart Software Manager, a centralized portal that enables you to manage all your Cisco software licenses from one centralized website.
- **Reporting:** Through the portal, Smart Licensing offers an integrated view of the licenses you have purchased and what has been deployed in your network. You can use this data to make better purchasing decisions, based on your consumption.

Smart Licensing Features

- Your device initiates a call home and requests the licenses it needs.
- Pooled licences - Licences are company account-specific, and can be used with any compatible device in your company. You can activate or deactivate different types of licenses on the device without actually installing a license file on the device.

- Licenses are stored securely on Cisco servers.
- Licenses can be moved between product instances without license transfer. This greatly simplifies the reassignment of a software license as part of the Return Material Authorization (RMA) process.
- It provides a complete view of all the Smart Software Licenses used in the network using a consolidated usage report of software licenses and devices in one easy-to-use portal.

Cisco Smart Account

Cisco Smart Account is an account where all products enabled for Smart Licensing are deposited. Cisco Smart Account allows you to manage and activate your licenses to devices, monitor license use, and track Cisco license purchases. Through transparent access, you have a real-time view into your Smart Licensing products. IT administrators can manage licenses and account users within your organization's Smart Account through the Smart Software Manager.

When creating a Smart Account, you must have the authority to represent the requesting organization. After you submit the request, it goes through a brief approval process. Access <http://software.cisco.com> to learn about, set up, or manage Smart Accounts.

Cisco Smart Software Manager Overview

Cisco Smart Software Manager enables you to manage all your Cisco Smart software licenses from one centralized website. With Cisco Smart Software Manager, you organize and view your licenses in groups called virtual accounts (collections of licenses and product instances). Use the Cisco Smart Software Manager to do the following tasks:

- Create, manage, or view virtual accounts.
- Create and manage Product Instance Registration Tokens.
- Transfer licenses between virtual accounts or view licenses.
- Transfer, remove, or view product instances.
- Run reports against your virtual accounts.
- Modify your email notification settings.
- View overall account information.

Virtual Accounts

A Virtual Account exists as a sub-account tithing the Smart Account. Virtual Accounts are a customer-defined structure based on organizational layout, business function, geography, or any defined hierarchy. They are created and maintained by the Smart Account administrator. Smart Licensing allows you to create multiple license pools or virtual accounts within the Smart Software Manager portal. Using the Virtual Accounts option that you can aggregate licenses into discrete bundles that are associated with a cost center so that one section of an organization cannot use the licenses of another section of the organization. For example, if you segregate your company into different geographic regions, you can create a virtual account for each region to hold the licenses and product instances for that region.

All new licenses and product instances are placed in the default virtual account in the Smart Software Manager, unless you specify a different one during the order process. After you access the default account, you may choose to transfer them to any other account, provided you have the required access permissions.

Use the Smart Software Manager portal to create license pools or transfer licenses.

Product Instance Registration Tokens

A product requires a registration token until you have registered the product. On successful registration, the device receives an identity certificate. This certificate is saved and automatically used for all future communications with Cisco. Registration tokens are stored in the Product Instance Registration Token Table that is associated with your enterprise account. Registration tokens can be valid 1–365 days.

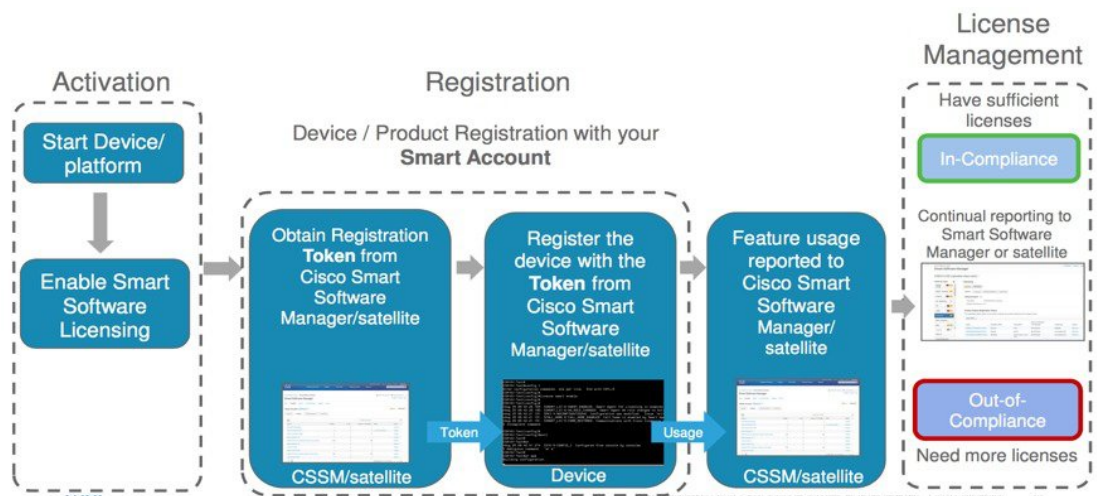
Product Instances

A product instance is an individual device with a unique device identifier (UDI) that is registered using a product instance registration token (or registration token). You can register any number of instances of a product with a single registration token. Each product instance can have one or more licenses residing in the same virtual account. Product instances must periodically connect to the Cisco Smart Software Manager servers during a specific renewal period. If you remove the product instance, its licenses are released and made available within the virtual account.

Smart Licensing Work Flow

The following figure depicts a working model of smart licensing that involves a three-step procedure.

Figure 1: Smart Licensing Work Flow



1. **Setting up Smart Licensing:** You can place the order for Smart Licensing, to manage licenses on the Cisco.com portal. You agree to the terms and conditions governing the use and access of Smart Licensing in the Smart Software Manager portal.
2. **Enabling and Use Smart Licensing:** Smart Licensing is enabled by default. You can use either of the following options to communicate:
 - **Smart Call Home:** The Smart Call Home feature is automatically configured when Smart Licensing is enabled. Smart Call Home is used by Smart Licensing as a medium for communication with the Cisco license service. Call Home feature allows Cisco products to periodically call-home and perform an audit and reconciliation of your software usage information. This information helps Cisco efficiently track your install base, keep them up and running, and effectively pursue service and support contract renewals. For more information on Smart Call Home feature, see http://www.cisco.com/c/dam/en/us/td/docs/switches/lan/smart_call_home/SCH_Deployment_Guide.pdf.
 - **Smart Software Manager Satellite :** is a component of Cisco Smart Licensing and works with Cisco Smart Software Manager (SSM). It helps customers intelligently manage product licenses, providing near real-time visibility and reporting of the Cisco licenses they purchase and consume.

For customers who do not want to manage their installed base using a direct Internet connection, the Smart Software Manager satellite is installed on the customer premises and provides a subset of Cisco SSM functionality. After you download the satellite application, deploy it, and register it to Cisco SSM, you can perform the following functions locally:

- Activate or register a license
- Get visibility to your company's licenses
- Transfer licenses between company entities

Periodically, the satellite must synchronize with Cisco SSM to reflect the latest license entitlements.

For more information about the Smart Software Manager satellite, see <http://www.cisco.com/c/en/us/buy/smart-accounts/software-manager-satellite.html>.

3. **Manage and Report Licenses:** You can manage and view reports about your overall software usage in the Smart Software Manager portal. Compliance reporting describes the types of Smart Licensing reports.

Benefits of Smart Licensing

- Licenses are not locked to perform configurations even if the license limit exceeds the paid license limit. You are notified with out-of-compliance notification to buy additional licenses when the license limit exceeds the paid license limit. This saves time with the ability to transfer licenses across the organization.
- Licenses can be pooled across the entire organization, enabling them to be reused across organizational boundaries.
- Provides software asset management information so that you can plan and track the licenses.

Licensing in NCS 1004

Cisco NCS 1004 has the following line card PIDs :

- **NCS1K4-1.2T-K9**—High-cost PID. This card does not support smart licensing.
- **NCS1K4-1.2T-L-K9**—Licensed PID for 1.2T line card and the licenses are charged per port.
- **NCS1K4-OTN-XPL**—Licensed PID for OTN-XP line card.
- **NCS1K4-QXP-L-K9**—Licensed PID for QXP line card.
- **NCS1K4-QXP-K9** —Non-licensed PID for QXP line card.
- **S-NCS1K4-ULE-400**— Licensed PID for 400G encryption for OTN-XP Card.

You can use either one or a combination of both types of the 1.2T line card in the NCS 1004.

Software Entitlements of Cisco NCS 1004

Software entitlement is a system that consists of a license manager on Cisco NCS 1004. The license manager manages licenses for various software and hardware features. The license manager parses and authenticates the license before accepting it.

The following table lists the features and its corresponding entitlements that can be enabled on Cisco NCS 1004 using licenses:

Table 1: Software Entitlements of Cisco NCS 1004

Feature	Software Entitlement
NCS1K4 Smart License-one QSFP28 client	S-NCS1K4-LIC-100G=
NCS1K4 Smart License - one QSFP28 client with encryption	S-NCS1K4-LIC-100X=
NCS1K4 Smart License - 100Gbps of client bandwidth	S-NCS1K4-100G-CL=
NCS1K4 Smart License - Long Haul	S_NCS1K4_LONGHAUL
NCS1K4 Smart License - Subsea	S_NCS1K4_SUBSEA

The licenses are charged per port basis and dependent on the number of trunk ports and client ports that you configure. The license count for the configuration of 4 x 100GE client ports or lesser is zero. For configurations greater than 4 x 100GE client ports, the license count is incremented by one for every 100GE client port configured at the slice level. The license count for the trunk port is incremented based on the BPS & optics configuration.

Generic Smart Licensing

Generic Smart Licensing feature allows you to purchase licenses that can be used on 2-QDD-C card, 1.2T card, and OTN XP card with any client data rate with or without encryption. This feature further simplifies license procurement and management of licensing.

Table 2: Feature History

Feature Name	Release Information	Feature Description
Generic Smart License	Cisco IOS XR Release 7.10.1	Smart licensing functionality is enhanced to enable you to use one common license across cards and functionalities. Hence, a single license will provide entitlement to use 2-QDD-C card, 1.2T card, and OTN XP card, with encryption enabled or disabled, and for different client data rates. This feature reduces license procurement and management effort.

Generic Smart Licensing Software Entitlements of Cisco NCS 1004:

Feature	Software Entitlement
NCS1K4 - 100G without encryption	S_NCS1K4_100
NCS1K4 smart license - 100G with encryption	S-NCS1K4-LIC-100X=

Feature	Software Entitlement
NCS1K4 - 400G without encryption	S_NCS1K4_400
NCS1K4 - 100G with encryption	S-NCS1K4-LIC-100X=
NCS1K4 - 400G - with encryption	S_NCS1K4_400_ENC

Verifying the Generic Smart Licensing

The following sample output displays 100G smart licensing summary without encryption on 1.2T card:

```
RP/0/RP0/CPU0:ios#show license summary
Fri Feb 24 14:42:02.029 UTC

Smart Licensing is ENABLED

Registration:
  Status: REGISTERED
  Smart Account: BU Production Test
  Virtual Account: NCS1000
  Export-Controlled Functionality: ALLOWED
  Last Renewal Attempt: None
  Next Renewal Attempt: Aug 14 2023 16:53:02 UTC

License Authorization:
  Status: AUTHORIZED
  Last Communication Attempt: SUCCEEDED
  Next Communication Attempt: Mar 26 2023 14:41:27 UTC
```

```
License Usage:
  License                               Entitlement Tag                Count Status
  -----
  NCS1K4 - 100G                        (S_NCS1K4_100)                  7 AUTHORIZED
```

The following sample output displays 100G smart license summary with encryption on 1.2T card:

```
RP/0/RP0/CPU0:ios#show license summary
Fri Feb 24 14:42:02.029 UTC

Smart Licensing is ENABLED

Registration:
  Status: REGISTERED
  Smart Account: BU Production Test
  Virtual Account: NCS1000
  Export-Controlled Functionality: ALLOWED
  Last Renewal Attempt: None
  Next Renewal Attempt: Aug 14 2023 16:53:02 UTC

License Authorization:
  Status: AUTHORIZED
  Last Communication Attempt: SUCCEEDED
  Next Communication Attempt: Mar 26 2023 14:41:27 UTC
```

```
License Usage:
  License                               Entitlement Tag                Count Status
  -----
  NCS1K4 smart license...              (S-NCS1K4-LIC-100X=)           1 AUTHORIZED
```

The following sample output displays 100G smart licensing without encryption on OTN-XP card:

```
RP/0/RP0/CPU0:ios#show license summary
Fri Feb 24 14:42:02.029 UTC
```

```
Smart Licensing is ENABLED
```

Registration:

```
Status: REGISTERED
Smart Account: BU Production Test
Virtual Account: NCS1000
Export-Controlled Functionality: ALLOWED
Last Renewal Attempt: None
Next Renewal Attempt: Aug 14 2023 16:53:02 UTC
```

License Authorization:

```
Status: AUTHORIZED
Last Communication Attempt: SUCCEEDED
Next Communication Attempt: Mar 26 2023 14:41:27 UTC
```

License Usage:

License	Entitlement Tag	Count	Status
NCS1K4 - 100G	(S_NCS1K4_100)	1	AUTHORIZED

The following sample output displays 100G smart licensing with encryption on OTN-XP card:

```
RP/0/RP0/CPU0:ios#show license summary
Fri Feb 24 14:42:02.029 UTC
```

```
Smart Licensing is ENABLED
```

Registration:

```
Status: REGISTERED
Smart Account: BU Production Test
Virtual Account: NCS1000
Export-Controlled Functionality: ALLOWED
Last Renewal Attempt: None
Next Renewal Attempt: Aug 14 2023 16:53:02 UTC
```

License Authorization:

```
Status: AUTHORIZED
Last Communication Attempt: SUCCEEDED
Next Communication Attempt: Mar 26 2023 14:41:27 UTC
```

License Usage:

License	Entitlement Tag	Count	Status
NCS1K4 smart license...	(S-NCS1K4-LIC-100X=)	1	AUTHORIZED

The following sample output displays smart licensing support for 400G without encryption on OTN-XP card:

```
RP/0/RP0/CPU0:ios#show license summary
Fri Feb 24 14:42:02.029 UTC
```

```
Smart Licensing is ENABLED
```

Registration:

```
Status: REGISTERED
Smart Account: BU Production Test
Virtual Account: NCS1000
Export-Controlled Functionality: ALLOWED
Last Renewal Attempt: None
Next Renewal Attempt: Aug 14 2023 16:53:02 UTC
```

License Authorization:

```
Status: AUTHORIZED
Last Communication Attempt: SUCCEEDED
```

Next Communication Attempt: Mar 26 2023 14:41:27 UTC

License Usage:

License	Entitlement Tag	Count	Status
NCS1K4 - 400G	(S_NCS1K4_400)	1	AUTHORIZED

The following sample output displays smart licensing support for 400G with encryption on OTN-XP card:

```
RP/0/RP0/CPU0:ios#show license summary
Fri Feb 24 14:42:02.029 UTC
```

Smart Licensing is ENABLED

Registration:

```
Status: REGISTERED
Smart Account: BU Production Test
Virtual Account: NCS1000
Export-Controlled Functionality: ALLOWED
Last Renewal Attempt: None
Next Renewal Attempt: Aug 14 2023 16:53:02 UTC
```

License Authorization:

```
Status: AUTHORIZED
Last Communication Attempt: SUCCEEDED
Next Communication Attempt: Mar 26 2023 14:41:27 UTC
```

License Usage:

License	Entitlement Tag	Count	Status
NCS1K4 - 400G - ENC	(S_NCS1K4_400_ENC)	1	AUTHORIZED

Creating a Token

To create a new token using Cisco Smart Software Manager, perform the following tasks:

Procedure

- Step 1** Log in to the Cisco Smart Software Manager.
<https://software.cisco.com/software/csws/ws/platform/home#SmartLicensing-Inventory>
- Step 2** Select the token with the name that was provided while creating the token.
- Step 3** Click on the blue arrow on the token. The token ID generates.
- Step 4** Copy the token and register the NCS1004 with the same token ID.

Configure Smart Licensing

To configure smart licensing in Cisco NCS 1004, perform the following tasks:

Procedure

Step 1 Configure the domain name server for the smart license server.

Example:

```
RP/0/RP0/CPU0:ios#configure
Sat Dec 15 15:25:14.385 IST
RP/0/RP0/CPU0:NCS1004(config)#domain name-server 198.51.100.247
```

Step 2 Setup the CiscoTAC-1 profile and destination address for Smart Call Home, using the following commands:

call-home

service active

contact smart-licensing

profile CiscoTAC-1

active

destination address http {http|https}://{FQDN}/its/service/oddce/services/DDCEService

destination transport-method http

Note

FQDN must be either Cisco Smart Software Manager FQDN (tools.cisco.com) or Smart Licensing satellite server FQDN. You must configure the DNS server before setting-up the call-home destination address as FQDN. Use the **domain name-server {DNS server IP}** command to configure the DNS server on the device.

Example:

```
domain name-server 198.51.100.247
call-home
service active
contact smart-licensing
profile CiscoTAC-1
active
destination address http https://tools.cisco.com/its/service/oddce/services/DDCEService
destination transport-method http
```

Note

CiscoTAC-1 profile is the default profile for smart licensing and it must not be deleted.

Step 3 Configure the crypto ca Trust point profile, if CRL distribution point is not defined in the Satellite server certificate or if the device is not able to reach the host mentioned in the CRL distribution point.

Example:

```
RP/0/RP0/CPU0:ios(config)#crypto ca trustpoint Trustpool crl optional
```

Step 4 Create and copy the registration token ID using Cisco Smart Software Manager.

For more details about creating a token, see [Creating a Token, on page 8](#).

Step 5 In the privileged EXEC mode, register the token ID in Cisco NCS 1004, using the following commands:

license smart register idtoken *token-ID*

The registration may fail if the token is invalid or there is communication failure between the device and the portal or satellite. If there is a communication failure, there is a wait time of 24 hours before the device attempts to register again. To force the registration, use the **license smart register idtoken *token-ID* force** command.

When your device is taken off the inventory, shipped elsewhere for redeployment, or returned to Cisco for replacement using the return merchandise authorization (RMA) process, you can use the **license smart deregister** command to cancel the registration on your device. All smart licensing entitlements and certificates on the platform are removed.

ID certificates are renewed automatically after six months. In case, the renewal fails, the product instance goes into unidentified state. You can manually renew the ID certificate using the **license smart renew id** command.

Authorization periods are renewed by the Smart Licensing system every 30 days. As long as the license is in an 'Authorized' or 'Out-of-Compliance' (OOC), the authorization period is renewed. Use the **license smart renew auth** command to make an on-demand manual update of your registration. Thus, instead of waiting 30 days for the next registration renewal cycle, you can issue this command to instantly find out the status of your license.

After 90 days, the authorization period expires and the status of the associated licenses display "AUTH EXPIRED". Use the **license smart renew auth** command to retry the authorization period renewal. If the retry is successful, a new authorization period begins.

Verifying Smart Licensing Configuration

After enabling Smart Licensing, you can use the **show** commands to verify the default Smart Licensing configuration. If any issue is detected, take corrective action before making further configurations.

- **show license all**
- **show license trace all**
- **show license status**
- **show license summary**
- **show license tech**
- **Show license udi**
- **show license usage**
- **show license platform detail**
- **show license platform summary**
- **show license platform trace**
- **Show license platform trace all**
- **show tech-support smartlic**
- **show call-home detail**
- **show call-home trace all**
- **show tech-support call-home**

The following table defines the available license authorization status in Cisco NCS 1004:

Table 3: License Authorization Status

License Authorization Status	Description
Unconfigured	Smart Software Licensing is not configured.
Unidentified	Smart Software Licensing is enabled but is not registered.
Registered	Device registration is completed and an ID certificate is received that is used for future communication with the Cisco licensing authority.
Authorized	Registration is completed with a valid Smart Account and license consumption has begun. This indicates compliance.
Out of Compliance	Consumption exceeds available licenses in the Smart Account.
Authorization Expired	The device is unable to communicate with the Cisco Smart Software Manager for an extended period. This state occurs after 90 days of expiry. The device attempts to contact the CSSM every hour to renew the authorization until the registration period expires.

Example 1:

The following example shows the sample output of the **show license all** command.

```
RP/0/RP0/CPU0:SIT-5#show license all
Wed Sep 22 17:18:19.761 IST

Smart Licensing Status
=====

Smart Licensing is ENABLED

Registration:
  Status: REGISTERED
  Smart Account: BU Production Test
  Virtual Account: NCS1000
  Export-Controlled Functionality: ALLOWED
  Initial Registration: SUCCEEDED on Jun 21 2021 12:40:52 IST
  Last Renewal Attempt: None
  Next Renewal Attempt: Dec 18 2021 12:40:51 IST
  Registration Expires: Jun 21 2022 12:35:49 IST

License Authorization:
  Status: AUTHORIZED on Sep 09 2021 11:45:43 IST
  Last Communication Attempt: SUCCEEDED on Sep 09 2021 11:45:43 IST
  Next Communication Attempt: Oct 09 2021 11:45:42 IST
  Communication Deadline: Dec 08 2021 11:40:41 IST

Export Authorization Key:
  Features Authorized:
    <none>

Utility:
  Status: DISABLED

Data Privacy:
  Sending Hostname: yes
  Callhome hostname privacy: DISABLED
  Smart Licensing hostname privacy: DISABLED
```

```

Version privacy: DISABLED

Transport:
  Type: Callhome

Miscellaneous:
  Custom Id: <empty>

License Usage
=====

NCS1K4 - Subsea - 1.2T Line Card (S_NCS1K4_SUBSEA):
  Description: NCS1K4 - Subsea - 1.2T Line Card
  Count: 3
  Version: 1.0
  Status: AUTHORIZED
  Export status: NOT RESTRICTED

NCS1K4 smart license - one QSFP28 client (S-NCS1K4-LIC-100G=):
  Description: NCS1K4 smart license - one QSFP28 client
  Count: 18
  Version: 1.0
  Status: AUTHORIZED
  Export status: NOT RESTRICTED

NCS1K4 smart license - one QSFP28 client with encryption (S-NCS1K4-LIC-100X=):
  Description: NCS1K4 smart license - one QSFP28 client with encryption
  Count: 2
  Version: 1.0
  Status: AUTHORIZED
  Export status: NOT RESTRICTED

NCS1K4 - Long Haul - 1.2T Line Card (S_NCS1K4_LONGHAUL):
  Description: NCS1K4 - Long Haul - 1.2T Line Card
  Count: 2
  Version: 1.0
  Status: AUTHORIZED
  Export status: NOT RESTRICTED

Product Information
=====
UDI: SN:CAT2249B009,UUID:default-sdr

Agent Version
=====
Smart Agent for Licensing: 4.13.32_rel/85

Reservation Info
=====
License reservation: DISABLED

```

Example 2:

The following example shows the sample output of the **show license platform detail** command.

```

RP/0/RP0/CPU0:ios#show license platform detail
Mon Feb 11 15:59:55.422 IST
Current state:    REGISTERED

Collection: LAST: Mon Feb 11 2019 15:57:53 IST
              NEXT: Mon Feb 11 2019 16:57:53 IST
Reporting:  LAST: Mon Feb 11 2019 15:57:53 IST
              NEXT: Tue Feb 12 2019 15:57:53 IST

```

```

Parameters: Collection interval:      60 minute(s)
            Reporting interval:      1440 minute(s)
            Throughput gauge:        1000000 Kbps

=====
Feature/Area 'system'
  Name: System
  Status: ACTIVE
  Flags: CONFIG

  [ 1] Name: NCS1K4 smart license - one QSFP28 client
        Entitlement Tag:
regid.2018-05.com.cisco.S-NCS1K4-LIC-100G=,1.0_03df009f-5ac5-48da-af50-4279ddea5e24
        Count: Last reported:      8
                Next report:      0
  [ 2] Name: NCS1K4 smart license - one QSFP28 client with encryption
        Entitlement Tag:
regid.2018-05.com.cisco.S-NCS1K4-LIC-100X=,1.0_3938b0c5-f635-4426-9f0f-936d930cea9e
        Count: Last reported:      8
                Next report:      0

```

Example 3:

The following example shows the sample output of the **show license status** command.

```

RP/0/RP0/CPU0:ios#show license status
Mon Feb 11 16:02:24.499 IST

Smart Licensing is ENABLED
  Initial Registration: SUCCEEDED on Mon Feb 11 2019 15:51:10 IST
  Last Renewal Attempt: None
  Next Renewal Attempt: Sat Aug 10 2019 15:52:10 IST
  Registration Expires: Tue Feb 11 2020 15:46:59 IST

License Authorization:
  Status: AUTHORIZED on Mon Feb 11 2019 15:53:40 IST
  Last Communication Attempt: SUCCEEDED on Mon Feb 11 2019 15:53:40 IST
  Next Communication Attempt: Wed Mar 13 2019 15:53:39 IST
  Communication Deadline: Sun May 12 2019 15:47:29 IST

```

Example 4:

The following example shows the sample output of the **show license usage** command.

```

RP/0/RP0/CPU0:ios#show license usage
Mon Feb 11 15:59:29.817 IST

License Authorization:
  Status: AUTHORIZED on Mon Feb 11 2019 15:53:40 IST

NCS1K4 smart license - one QSFP28 client (S-NCS1K4-LIC-100G=):
  Description: NCS1K4 smart license - one QSFP28 client
  Count: 8
  Version: 1.0
  Status: AUTHORIZED

NCS1K4 smart license - one QSFP28 client with encryption (S-NCS1K4-LIC-100X=):
  Description: NCS1K4 smart license - one QSFP28 client with encryption
  Count: 8

```

```
Version: 1.0
Status: AUTHORIZED
```

Example 5:

The following example shows the sample output of the **show license udi** command.

```
RP/0/RP0/CPU0:ios#show license udiMon Feb 11 16:02:46.733 IST

Product Information
=====
UDI: SN:CAT2231B18Y,UUID:default-sdr
```

Criteria for the License Consumption of Subsea Networks

Table 4: Feature History

Feature Name	Release Information	Feature Description
Licensing Feature Update	Cisco IOS XR Release 7.3.2	Criteria for license consumption in Long Haul and Subsea networks are introduced. Long Haul (LH) and Subsea are two trunk-based license models that are implemented regardless of the line rate, in addition to the existing client-based licenses. These license models allow the user to easily track the status of licenses and software usage trends. The long-haul license is required to enable QPSK and 8QAM modes. The subsea license is required to enable BPSK and subsea specific controls such as extended chromatic dispersion, special non-linear compensation settings and so on.

The criteria for license consumption of subsea networks are as follows:

- If you configure any of the following configurations on the trunk port and the configurations are present in the output of **show running-configuration** command, then the license is consumed.
 - Ios(config-optics)#filter-roll-off-factor <0-1>
 - Ios(config-optics)#rx-voa target-power <-190,+30>
 - Ios(config-optics)#rx-voa fixed-ratio <+100,+1700>
 - Ios(config-optics)#enh-colorless-mode <1-3>
 - Ios(config-optics)#enh-sop-tol-mode <1-3>
 - Ios(config-optics)#nleq-comp-mode <1-4>
 - Ios(config-optics)#cross-pol-gain-mode <1-15>

- `Ios(config-optics)#cross-pol-weight-mode <1-7>`
- `Ios(config-optics)#cpr-win-mode <1-15>`
- `Ios(config-optics)#cpr-ext-win-mode <1-15>`
- The license is consumed if the bps value is in the range of 1–2 bits per symbol or 1, excluding the boundary value of 2 in the following command:

```
show controller optics <trunk-port>
```
- The license is consumed if the cd-min value is less than -10000 or cd-max value is greater than 100000, excluding the boundary values in the output of the following command:

```
show controller optics <trunk-port>
```

Example for License Consumption:

The following output of **show license usage** command shows the license usage count as one.

```
RP/0/RP0/CPU0:BH-SIT2#show license usage
Tue Aug 3 11:12:42.440 IST
License Authorization:
Status: AUTHORIZED on Aug 03 2021 11:10:12 IST
NCS1K4 - Subsea - 1.2T Line Card (S_NCS1K4_SUBSEA):
Description: NCS1K4 - Subsea - 1.2T Line Card
Count: 1
Version: 1.0
Status: AUTHORIZED
Export status: NOT RESTRICTED
```

Criteria for the License Consumption of Long Haul Networks

The smart license is consumed if the bps value is in the range of 2–4 bits per symbol including the boundary values in the output of the following command:

```
show controller optics 0/1/0/1
```

Example:

```
show controller optics 0/1/0/1
      Bits per symbol = 3.0000000000 bits/symbol
```

In the above example, the bits per symbol value is 3, so the license is consumed.

**Note**

- The license is consumed even when the trunk port is in shutdown state.
- The license is consumed only when the line card is up and running.

Example for License Consumption:

The following output of **show license usage** command shows the license usage count as two:

```
RP/0/RP0/CPU0:SIT-4#show license usage
Tue Aug 3 15:53:48.453 IST
License Authorization:
NCS1K4 - Long Haul - 1.2T Line Card (S_NCS1K4_LONGHAUL):
Description: NCS1K4 - Long Haul - 1.2T Line Card
Count: 2
```

```
Version: 1.0
Status: AUTHORIZED
Export status: NOT RESTRICTED
```

License Registration

You can use the following procedure to register license:

Procedure

Step 1 Register the license using the following command:

```
RP/0/RP0/CPU0:ios#license smart register idtoken <idtoken>
```

Step 2 Browse to the URL : <https://software.cisco.com/software/cs/ws/platform/home#module/SmartLicensing>.

Step 3 Click **Inventory**.

Step 4 Click **Product Instances**.

Step 5 Select the node instance.

Step 6 Click **Actions**.

Step 7 Click **Remove**.

Step 8 Renew the authorization period using the following command:

```
RP/0/RP0/CPU0:ios#license smart renew auth

RP/0/RP0/CPU0:ios#show logging | i "Data and signature"
Thu May 27 09:57:02.237 UTC
RP/0/RP0/CPU0:May 27 09:54:57.783 UTC: smartlicserver[311]:
LICENSE-SMART_LIC-3-AUTH_RENEW_FAILED : Authorization renewal with the Cisco Smart Software Manager
(CSSM) :
Error received from Smart Software Manager: Data and signature do not match for udi
PID:8812,SN:FOX2202WIVM
```

Note

The error message in the output of the **show logging** command is expected and is due to loss of synchronization between the CSSM server and the device after removing the product instance directly from the CSSM server.

Step 9 Perform deregister using the following command:

```
RP/0/RP0/CPU0:ios#license smart deregister

RP/0/RP0/CPU0:ios#show logging | i DEREG
Thu May 27 14:48:58.170 UTC
RP/0/RP0/CPU0:May 27 09:58:58.464 UTC: smartlicserver[311]:
%LICENSE-SMART_LIC-3-AGENT_DEREG_FAILED : Smart Agent for Licensing DeRegistration with Cisco Smart
Software Manager (CSSM) failed:
Agent received a failure status in a response message. Please check the Agent log file for the detailed
message.
```

Note

The error message in the output of the **show logging** command is expected.

Smart Licensing Transport Modes

Smart Licensing software management solution enables you to choose from one of the three transport modes, Cisco Smart Licensing Utility(CSLU), Smart Transport or Offline modes. This is in addition to the existing Call-Home mode. The default transport mode is CSLU, but you can change the mode to Call-Home, Smart Transport or Offline mode.

The following transport modes are available for you to choose now:

- Call-Home
- Smart
- CSLU
- Offline

Configure Callhome

You can use the Call Home to connect to the CSSM. To configure callhome, perform the following steps:

Procedure

Step 1 Use this sample configuration to enable call home mode settings.

Example:

```
RP/0/RP0/CPU0:ios#call-home
RP/0/RP0/CPU0:ios (config-call-home)#service active
RP/0/RP0/CPU0:ios (config-call-home)#contact smart-licensing
RP/0/RP0/CPU0:ios (config-call-home)#profile CiscoTAC-1
RP/0/RP0/CPU0:ios (config-call-home-profile)#active
RP/0/RP0/CPU0:ios (config-call-home-profile)#destination address http
https://tools.cisco.com/its/service/oddce/services/DDCEService
RP/0/RP0/CPU0:ios (config-call-home-profile)#reporting smart-call-home-data
RP/0/RP0/CPU0:ios (config-call-home-profile)#reporting smart-licensing-data
RP/0/RP0/CPU0:ios (config-call-home-profile)#destination transport-method email disable
RP/0/RP0/CPU0:ios (config-call-home-profile)#destination transport-method http
RP/0/RP0/CPU0:ios (config-call-home-profile)#commit
RP/0/RP0/CPU0:ios (config-call-home-profile)#end
```

Step 2 Use this sample configuration to enable a domain name server.

Example:

```
RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios (config)#domain name cisco.com
RP/0/RP0/CPU0:ios (config)#domain name-server 64.102.6.247
RP/0/RP0/CPU0:ios (config)#commit
RP/0/RP0/CPU0:ios (config)#end
```

Step 3 Use this sample configuration to enable CRL Configuration.

Example:

```
RP/0/RP0/CPU0:ios#config
```

```
RP/0/RP0/CPU0:ios(config)#crypto ca trustpoint Trustpool crl optional
RP/0/RP0/CPU0:ios(config)#commit
RP/0/RP0/CPU0:ios(config)#end
```

Step 4 Use this sample configuration to enable Call Home as transport mode.

Example:

```
RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#License smart transport callhome
RP/0/RP0/CPU0:ios(config)#commit
RP/0/RP0/CPU0:ios(config)#end
```

Verify whether the Callhome is Configured.

```
RP/0/RP0/CPU0:ios#show license all
Transport: Type: Callhome
```

Step 5 Use this sample configuration to establish trust using id-token.

Example:

```
license smart trust idtoken Zesdf3243u48329fdfhsfhsfkjs1233j4h1j1j4j41n
```

Configure Smart Transport

You can use the smart transport as an alternative option to Call Home, to connect to the CSSM. To configure smart transport, perform the following steps:

Procedure

Step 1 Use this sample configure "Smart" proxy and "hostname"

Example:

```
RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#license smart proxy port 80
RP/0/RP0/CPU0:ios(config)#license smart proxy hostname proxy.esl.cisco.com
RP/0/RP0/CPU0:ios(config)#commit
RP/0/RP0/CPU0:ios(config)#end
```

Step 2 Use this sample configuration to enable CRL Configuration.

Example:

```
RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#crypto ca trustpoint Trustpool crl optional
RP/0/RP0/CPU0:ios(config)#commit
RP/0/RP0/CPU0:ios(config)#end
```

Step 3 Use this sample configuration to enable Call Home.

Example:

```
RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#License smart transport smart
```

```
RP/0/RP0/CPU0:ios(config)#commit
RP/0/RP0/CPU0:ios(config)#end
```

Verify whether Smart Transport is Configured.

```
RP/0/RP0/CPU0:ios#show license all
Transport:
  Type: Smart
  URL: https://smartreceiver.cisco.com/licservice/license
  Proxy:
    Address: proxy.esl.cisco.com
    Port: 80
    Username: <empty>
    Password: <empty>
  VRF:
    Not Supported
```

Step 4 Use this sample configuration to establish trust using id-token.

Example:

```
license smart trust idtoken Zesdf3243u48329fdfhsfhsfkjs1233j4h1j1j4j41n
```

Configure CSLU

You can configure CSLU as one of the transport modes. CSLU is the default mode for software licensing policy. To configure CSLU, perform the following steps:

Procedure

Step 1 Use the **license smart url cslu http://<cslu-local>:8182/cslu/v1/pi** command to configure the CSLU URL.

Example:

In this sample configuration, the **10.127.59.44** is the CSLU URL that the on-premise server provided. This URL changes for each on-premise servers.

```
RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#license smart url cslu http://10.127.59.44:8182/cslu/v1/pi
RP/0/RP0/CPU0:ios(config)#commit
RP/0/RP0/CPU0:ios(config)#end
```

Step 2 Use this sample configuration to enable CRL Configuration.

Example:

```
RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#crypto ca trustpoint Trustpool crl optional
RP/0/RP0/CPU0:ios(config)#commit
RP/0/RP0/CPU0:ios(config)#end
```

Step 3 Use the **license smart transport cslu** command to enable CSLU.

Example:

```
RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#license smart transport cslu
```

```
RP/0/RP0/CPU0:ios(config)#commit
RP/0/RP0/CPU0:ios(config)#end
```

Step 4 Use the **show license all** command to verify the CSLU configuration.

Example:

The sample output shows the configuration transport type with the on-prem server address.

```
RP/0/RP0/CPU0:ios#show license all
Transport:
  Type: cslu
  Cslu address: http://10.127.59.44:8182/cslu/v1/pi
  Proxy:
    Not Configured
  VRF:
    Not Supported
```

Step 5 (Optional) Use the **license smart trust idtoken<token-id>** command to establish trust using id-token.

Example:

The command uses **Zesdf3243u48329fdfhsfhsfkjs1233j4h1j1j4j41n** as a sample token id.

```
RP/0/RP0/CPU0:ios#license smart trust idtoken Zesdf3243u48329fdfhsfhsfkjs1233j4h1j1j4j41n
```

Step 6 Use the **license smart sync all** command to send the license usage reports to server and receive the compliance status for the licenses consumed by the node.

Example:

```
RP/0/RP0/CPU0:ios#license smart sync all
Tue Aug 26 13:03:28.287 IST
```

Note

If you are using on-prem version 9-202407 or later, this command retrieves the on-prem account details and the compliance information.

The device uses CSLU transport for license communications, and all required trust relationships are established.

What to do next

- Review device status in Cisco Smart Software Manager.
- Ensure device reports successful license communication

Configure Offline

You can configure Offline as one of the options. To configure Offline, perform the following steps:

Procedure

Step 1 Use this sample configuration to disable transport.

Example:

```
RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#License smart transport off
RP/0/RP0/CPU0:ios(config)#commit
RP/0/RP0/CPU0:ios(config)#end
```

Step 2 Use this sample configuration to save the report.

Example:

```
RP/0/RP0/CPU0:ios#license smart save usage unreported /misc1/disk1/usage.txt
```

Step 3 Use this sample configuration to import the acknowledgment report.

Example:

```
RP/0/RP0/CPU0:ios#license smart import /misc/disk1/ACK_usage.txt
```

Smart Licensing for OTN-XP Line Card

Overview

- The license calculation is based on 100G client bandwidth and is independent of the client type.
- The licensed OTN-XP Line Card PID is NCS1K4-OTN-XPL.
- The license is charged based on the usage of 100G client bandwidth.

Checking the License Usage Count

You can also check the number of licenses utilised, by entering the **show license all** command.

Configuring Slice

The following sample shows the configuration of slice 0 in Muxponder mode.

```
RP/0/RP0/CPU0:ios(config)#hw-module location 0/1 mxponder-slice 0
trunk-rate 100G
client-port-rate 2 lane 3 client-type OTU2
client-port-rate 2 lane 4 client-type OTU2E
client-port-rate 4 lane 1 client-type 10GE
client-port-rate 4 lane 2 client-type OTU2
client-port-rate 4 lane 3 client-type OTU2E
client-port-rate 4 lane 4 client-type 10GE
client-port-rate 5 lane 1 client-type OTU2E
client-port-rate 5 lane 2 client-type 10GE
client-port-rate 5 lane 3 client-type OTU2
client-port-rate 5 lane 4 client-type OTU2E
```

Checking the Slice State

The following sample shows the status of the configured slice as **Provisioned**.

```
RP/0/RP0/CPU0:ios#show hw-module location 0/1 mxponder
Fri Dec 6 02:50:32.858 UTC

Location:          0/1
Slice ID:           0
Client Bitrate:     MIXED
```

```

Trunk Bitrate:      100G
Status:             Provisioned
LLDP Drop Enabled:  FALSE
Client Port
Mapper/Trunk Port   Peer/Trunk Port   OTU40/1/0/0
Traffic Split Percentage

OTU20/1/0/2/3      NONE      ODU20/1/0/0/2/3      100
OTU20/1/0/4/2      NONE      ODU20/1/0/0/4/2      100
OTU20/1/0/5/3      NONE      ODU20/1/0/0/5/3      100
OTU2E0/1/0/2/4      NONE      ODU2E0/1/0/0/2/4      100
OTU2E0/1/0/4/3      NONE      ODU2E0/1/0/0/4/3      100
OTU2E0/1/0/5/1      NONE      ODU2E0/1/0/0/5/1      100
OTU2E0/1/0/5/4      NONE      ODU2E0/1/0/0/5/4      100
TenGigEctr1r0/1/0/4/1  ODU2E0/1/0/0/4/1      NONE      100
TenGigEctr1r0/1/0/4/4  ODU2E0/1/0/0/4/4      NONE      100
TenGigEctr1r0/1/0/5/2  ODU2E0/1/0/0/5/2      NONE      100

```

Checking the License Count

The following sample shows the license usage count as 1.

```

RP/0/RP0/CPU0:ios#show license all
Fri Dec 6 02:58:39.906 UTC

Smart Licensing Status
=====

Smart Licensing is ENABLED

Registration:
  Status: REGISTERED
  Smart Account: BU Production Test
  Virtual Account: NCS1000
  Export-Controlled Functionality: ALLOWED
  Initial Registration: SUCCEEDED on Dec 06 2019 02:54:27 UTC
  Last Renewal Attempt: None
  Next Renewal Attempt: Jun 03 2020 02:54:26 UTC
  Registration Expires: Dec 05 2020 02:49:42 UTC

License Authorization:
  Status: AUTHORIZED on Dec 06 2019 02:56:50 UTC
  Last Communication Attempt: SUCCEEDED on Dec 06 2019 02:56:50 UTC
  Next Communication Attempt: Dec 06 2019 14:56:49 UTC
  Communication Deadline: Mar 05 2020 02:52:06 UTC

Export Authorization Key:
  Features Authorized:
    <none>

Utility:
  Status: DISABLED
Data Privacy:
  Sending Hostname: yes
  Callhome hostname privacy: DISABLED
  Smart Licensing hostname privacy: DISABLED
  Version privacy: DISABLED

Transport:
  Type: Callhome

License Usage
=====

NCS 1K4 smart License - 100Gbps of client bandwidth (S-NCS1K4-100G-CL=):
  Description: 100G Client bandwidth - Smart License

```

```

Count: 1
Version: 1.0
Status: Authorized
Export status: NOT RESTRICTED

Product Information
=====
UDI: SN:CAT2217B025,UUID:default-sdr

Agent Version
=====
Smart Agent for Licensing: 4.10.4_rel/21

Reservation Info
=====
License reservation: DISABLED

```



Note The license count for 10GE, OTU2, and OTU2e is calculated as follows:

- If $1 \leq \text{number of client ports used} \leq 10$, it implies the "S-NCS1K4-100G-CL=" has license count of 1 and similarly if $11 \leq \text{number of client ports used} \leq 20$, it implies the "S-NCS1K4-100G-CL=" has license count of 2 and so on.

Smart Licensing for QXP Line Card

- The license calculation is based on the number of trunk slices provisioned.
- Licensed PID for QXP line card is NCS1K4-QXP-L-K9.

Checking the License Usage Count

You can also check the number of licenses utilised, by entering the show license all command.

Configuring Slice

The following sample shows the configuration of slice 0 in 400GE TXP mode.

```

RP/0/RP0/CPU0:ios#configure
Thu Oct 21 23:12:12.906 UTC
RP/0/RP0/CPU0:ios(config)#hw-module location 0/1 mxponder-slice 0
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#trunk-rate 400G
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 1 client-type 400GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#commit

```

Checking the Slice State

The following sample shows the status of the configured slice as Provisioned.

```

RP/0/RP0/CPU0:ios#show hw-module location 0/1 mxponder-slice 0
Thu Oct 21 23:14:08.700 UTC

Location:          0/1
Slice ID:           0
Client Bitrate:     400GE
Trunk Bitrate:      400G
Status:             Provisioned
LLDP Drop Enabled:  FALSE

```

```

ARP Snoop Enabled:    FALSE
Client Port           Mapper/Trunk Port      CoherentDSP0/1/0/0
                      Traffic Split Percentage
FourHundredGigECtrlr0/1/0/1      -      100

```

Checking the License Count

The following sample shows the license usage count as 2.

```

RP/0/RP0/CPU0:ios#show license summary
Tue Dec 28 22:35:29.824 UTC

```

Smart Licensing is ENABLED

```

Registration:
  Status: REGISTERED
  Smart Account: BU Production Test
  Virtual Account: NCS1000
  Export-Controlled Functionality: ALLOWED
  Last Renewal Attempt: None
  Next Renewal Attempt: Jun 26 2022 22:19:25 UTC

```

```

License Authorization:
  Status: AUTHORIZED
  Last Communication Attempt: SUCCEEDED
  Next Communication Attempt: Jan 27 2022 22:33:09 UTC

```

```

License Usage:
  License           Entitlement Tag      Count Status
  -----
  NCS1K4 - QDD TXP Trunk  (S_N1K4_LIC_TRK)      2 AUTHORIZED

```